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	Radiant	
h m	°	°
A 6 35	$\alpha = 15$	$\delta = +45$
7 12	$\alpha = 18{\cdot}5$	$\delta = +44$
8 7	$\alpha = 23$	$\delta = +42$

En conclusion, la grande quantité de météores observés de ces jours est la même que l'ont vit en 1859 et en 1872; elle se présente avec un intervalle de 13 ans, qui correspond à la double période de la comète Biela-Gambart, avec laquelle cet essaim météorique a des relations immédiates.

De l'Observatoire de Moncalieri:
2 *Déc.* 1885.

Observations and Orbit of the Meteor Shower of 1885, *November* 27. By G. L. Tupman.

The meteors were first seen at about six o'clock, when they were falling very fast, three or four appearing simultaneously. Sitting at a north window my wife counted 300 meteors between $6^h\ 33^m$ and $6^h\ 45^m$, about one-third of which were bright, and many with trains which lasted a few seconds. The sky then clouded over. It cleared again about eight o'clock, when I went out and began to count, keeping the radiant point in the centre of the sphere of vision. With occasional interruptions from passing clouds, the following numbers were obtained:—

h m		h m			
8 13·0	to	8 20·0	...	100, or	14 per minute.
8 20·5		8 31·0	...	100,	10 ,,
8 48·5		8 58·0	...	63,	7 ,,
8 59·0		9 8·0	...	73,	8 ,,
9 10·0		9 15·0	...	45,	9 ,,

The sky then became permanently overcast, but at $10^h\ 30^m$, in an opening low down in the east, they were still falling fast.

From $8^h\ 14^m$ to $8^h\ 31^m$, from the same window, my wife counted 150. In those seventeen minutes I had counted 200 in the open air. It is, therefore, reasonable to suppose that an observer in the open air, between $6^h\ 33^m$ and $6^h\ 45^m$, would have seen 400 meteors, or 33 per minute.

The brighter ones were of about the 1st magnitude—a few as bright as *Jupiter* or *Venus*. Many left streaks which endured two or three seconds. I only saw two or three brilliant enough to be called fireballs.

At first, instead of mapping tracks, I carefully watched for greatly foreshortened paths in the immediate neighbourhood of the radiant. About one half, perhaps, of them radiated from a

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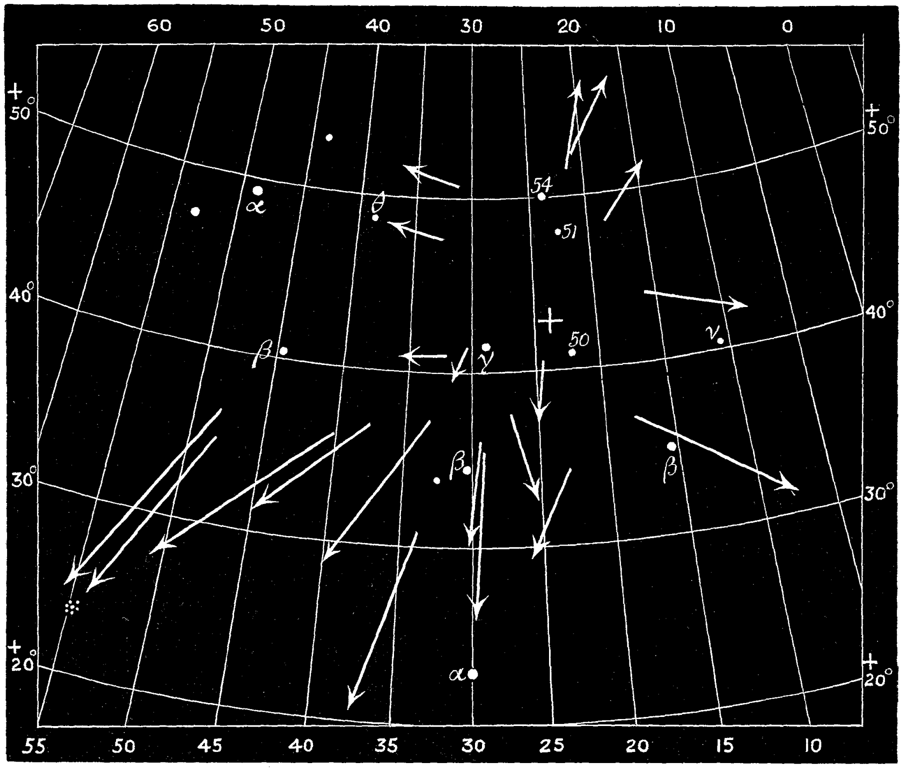
point midway between γ and 51 *Andromedæ,* in R.A. 27°, $\delta+44°$; but nothing was more remarkable than the fact that the other half did *not* radiate from that point. The tracks of many characteristic *Andromedes,* when carried mentally backwards, did not pass within 10° of it.

Meteor Paths, 1885, *Nov.* 27, *observed at Harrow.*



The position of the *Cometary* Radiant is shown thus +.

During the latter part of the watch I mapped twenty tracks, as shown on the accompanying cut, selecting those which admitted of being pretty accurately reproduced as to direction and general position. The clouds interrupted this work, but the paths mapped are very instructive as to the nature of the radiation. Radiation from $22°\frac{1}{2}+45°\frac{1}{2}$ is sharply indicated. On the chart the theoretical radiant point proper to particles of Biela's Comet, using the orbit of 1852,* viz. $23°\cdot5+43°\cdot0$, is indicated by a small cross. That is certainly not the point anyone would have fixed upon as the central position of the meteoric radiant. It falls, indeed, on the preceding limit of the radiant area. It is, perhaps, proper to mention that all the meteors moved slowly, in comparison with other showers. They were all white, except one which was a vivid red. One bright one stopped suddenly, became very much brighter; was stationary for about a second, then vanished.

On November 28, I watched for more than half an hour, about

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* Corrected for Precession.

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seven o'clock, with a perfectly clear sky, but only saw two *Andromedes*, no others.

The combination of the observations of this shower in 1872 and 1885 furnishes material for a calculation of the elements of the orbit without the necessity of assuming the mean distance to be the same as that of Biela's Comet. The only assumption I shall make is that, in the interval of thirteen years, the nucleus of the stream has made two complete revolutions.

In 1872, the maximum density of the shower was observed about November 27, 6^h G.M.T. On the present occasion the maximum would appear to have been about 5^h or 6^h G.M.T. The interval is 4748·0 mean solar days, and consequently the periodic time is 2374·0 days with very small error, corresponding to a mean distance of 3·4828.

The radius vector being common to both orbits (neglecting the dimensions of the Earth), the ratio of the orbital velocity of the meteors to that of the Earth is 1·30137 : 1.

The radiant points in the following table were determined with as much precision as is possible in such observations:—

	I. Nov. 26, 10^h	II. Nov. 27, 6^h	III. Nov. 27, 6^h	IV. Nov. 28, 9^h	V. Nov. 30, 7^h
Denning ...	26°·7 + 43°·5	24° + 43°·5	23° + 45°	22° + 43°·5	21° + 42°·5
Tupman (9^h)		27 + 44	22·5 + 45·5		

These positions and the mean distance and ratio of velocities above give the following orbits. The time of perihelion passage is shown for comparison with the presumed time of perihelion passage of Biela's Comet:—

P.P.	I. Dec. $27^d·9$	II. Dec. $27^d·8$	III. Dec. $26^d·7$	IV. Dec. $26^d·7$	V. Dec. $27^d·0$	Biela's Comet (A) Oct. 31 ?
☊	244°·9	245°·7	245°·7	246°·8	248°·8	246°·3
π	112·2	111·1	109·2	108·2	107·3	109·6
i	13·1	13·0	13·6	12·5	11·6	12·6
ϵ	·7556	·7532	·7508	·7470	·7432	·7559
q	·851	·860	·868	·881	·895	·861
$2a-q$ ...	6·114	6·106	6·097	6·085	6·071	6·191
Motion ...	D	D	D	D	D	D

Andromeda Meteors. By J. Rand Capron.

The display to which attention was drawn by circular from Dun Echt took place on the 27th, but earlier in the evening than was anticipated. It commenced soon after dusk and lasted till 9 P.M., when clouds and rain prevented further observations. Ten time records were taken at intervals at Guildown, and three other local ones have been communicated to me. At times the stars fell almost continuously, and occasionally three or four at